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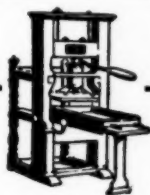
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SEED POTATO CERTIFICATION

In New Jersey, ten years ago, only a very small per cent of the potato acreage was planted with certified seed. At that time it was not uncommon to find fields with 50 per cent or more of the plants showing leaf roll, mosaic or other seed borne diseases. Now that more than 95 per cent of the acreage is planted with certified seed it is a rare occurrence to find fields showing large percentages of diseased plants. A similar situation exists in other states. If the potato specialists had done nothing else their efforts would be justified by this one accomplishment.

In recent years there has been a marked change, both in our knowledge of the diseases of the potato and in the procedure governing certification. In the earlier years, while every state offering the service made an effort to certify the best seed possible, there was little agreement concerning the regulations governing certification. Certain individuals also recognized the possibilities of a profit in handling certified seed and as a result some seed was certified in name only—the buyer soon found that this type of certified seed was not what it should be.

Realizing that the proper certification of seed potatoes is a boon to the potato growers, the Potato Association of America has been active in the prevention of fraudulent certification, as well as in the establishment of uniform certification standards and their proper interpretation. A set of regulations was presented at the last annual meeting and has been adopted by a number of states. The indications are that in the very near future, most, if not all states will be certifying seed under these or similar standards. This is a progressive step and our next job is to protect certified seed against fraud. This question is discussed by Mr. Gillig in this issue of the AMERICAN POTATO JOURNAL and more will be said concerning it in subsequent issues. It is a matter which should be of interest to every seed grower.

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BIOLOGICAL SPECIALIZATION IN PHYTOPHTHORA INFESTANS

DONALD REDDICK AND WILLARD CROSIER

Cornell University

Breeding wheat for resistance to stem-rust is tremendously complicated by the fact that there exist a large number of forms of the parasite which are identical in every known respect except that they possess different infecting capacities. Wheat variety A may be immune to rust X and susceptible to rust Y, whereas variety B may be susceptible to rust X and immune to rust Y. The same condition is well known in the case of beans and the organism that causes anthracnose. Numerous other examples exist. The phenomenon is commonly spoken of as biological or physiological specialization and the various forms of the parasitic organism are often called biotypes, races, physiological species, etc.

Up to the present time the potato breeder who has been working for blight resistance has not encountered such difficulties. In 1928 Reddick (1) reviewed the situation. He found nothing on record to indicate that biologic specialization in *Phytophthora infestans* existed and he presented some evidence pointing to the conclusion that such specialization scarcely is to be expected. More recently Müller (2) has tested cultures of *P. infestans* from a variety of sources in Europe. The tests were designed to determine whether biotypes existed on the Continent. Müller's records of extensive experimentation do not show the existence of such forms. On the other hand, such evidence may mean merely that the collections of the fungus all happened to be of the same kind. It would be possible to collect *Colletotrichum lindemuthianum* from 50 widely separated places in U. S. A. and by inoculating 50 selected varieties of dry-shell beans obtain a result which would point most strongly to the conclusion that this organism shows no biological specialization, were it not for the fact that at least 3 clear-cut forms are known.

In order to obtain some information about the possible occurrence of different forms of *P. infestans* in different parts of the world some tubers of plants exhibiting different degrees of resistance were distributed to various persons. To date reports have been received from

only two such collaborators. Six sorts were sent to Miss Yatzenina in Moscow, U. S. S. R., without record. In all six cases her record for blight resistance which she obtained in the autumn of 1928 corresponds exactly with the record made at Ithaca, N. Y. Ten sorts were tested by Dr. Karl Böning at Munich in Germany in 1930. Doctor Böning's record likewise corresponds with the Ithaca record in every detail except that his score for degree of resistance is consistently slightly lower than ours. This may indicate a somewhat more virulent parasite at Munich but it may mean merely that the season at Munich was more favorable for a satisfactory field test than usually prevails at Ithaca; or, perhaps it means nothing more than that the variety *Industrie* which was used for comparison in the Munich tests is somewhat more resistant than *Green Mountain* the variety used at Ithaca. At any rate the records from these two collaborators form no basis for concluding that *P. infestans* is biologically specialized. Miss Yatzenina also included records for several named varieties 7 of which have been tested at Ithaca. A comparison of the records shows that 6 are identical and only a small difference exists in the case of the variety *Pirola*, a difference wholly without significance owing to the method of taking records at Ithaca.

At a time when the search for biologic specialization in parasites has become a veritable mania it is not without significance that only one biotype of *P. infestans* has been recorded, and even that one (Berg's tomato fungus) is not as clear-cut as could be wished. It has been assumed by the writers, especially following a conversation with Dr. B. O. Dodge, that the failure of *P. infestans* to form oospores in nature forms a reasonable basis for assuming that this fungus the world over represents a single vegetative clone and that the variants which arise through sexual reproduction have not had an opportunity to appear. It is not denied that when parasitic fungi are grown on a suitable medium in pure culture sectors may appear which have a different appearance and that these mutations can be separated and carried along generation after generation. Tests with such mutants for ability to produce disease are not numerous and thus far there seems to be no record of cases in which the mutant exhibits a markedly different pathogenicity from its parent. No one ever has seen such a mutant in a culture of *P. infestans* but, of course, this may mean merely that since the fungus does not grow very well in culture, no one ever has had the patience to search for one.

Oospore production is not unknown in *P. infestans*.¹ Both Clinton (3) and Pethybridge (4) have found these bodies in pure cultures and more recently Miss de Bruyn (5) has found them in considerable abundance in pure cultures on a variety of media including bog (muck?) soil. Furthermore, Miss de Bruyn (6) has found that a properly dried culture of the fungus can withstand cold at -20 to

-26° C. for 5 days. She has determined that this cold tolerance is due either to resting bodies or to oospores but thus far she does not know for sure that the oospores alone may be responsible for perpetuating the fungus under such conditions. Observation of the germination of oospores after such treatment, or after any kind of treatment, is necessary. One may be very sure that Miss de Bruyn has tried thousands of times to find germinated oospores and that when she finds one she will make her results known very promptly.

It is not known whether the fairly abundant production of oospores in Holland is the reward for patient work or whether the particular isolation of the fungus which Miss de Bruyn has used really possesses a stronger tendency to produce these bodies. At any rate there may be significance in the fact that in a similar ocean climate and not so very far distant from Wageningen a new biologic form of *P. infestans* has been found in the summer of 1932. Schiek (7)* in his recent account establishes beyond question the occurrence of such a form from Streckenthin in northern Pomerania. His tables show, in fact, the existence of three forms.

It remains a question whether this biotype is a recent development or whether the introduction of the entirely new blood of *S. demissum* has brought out a variety of potato which makes possible the detection of a biotype already extant and heretofore undetected as well as undetectable because all varieties until now are susceptible to all forms. The new form was found at Streckenthin on hybrids of K. O. Müller's "W. Rasse." Müller has mentioned repeatedly that the origin of this wild immune plant is not positively known although he thinks it to have originated in Southern Chile. The "W" stands for Washington (D. C.) and means that the material undoubtedly was supplied by Dr. Wm. Stuart. Stuart has kept cultures of potatoes both from Pringle collections in Mexico and from Wight collections in South America. The fact that "W. Rasse" is very late, i.e., does not form tubers until the days are "short" and especially the fact that no other potato ever has been brought out of Chile that possesses any resistance to *P. infestans* has pointed very strongly to the likelihood that the culture is really of Mexican origin. Schiek's comparison of the "W" hybrids with his own *demissum* hybrids and the similarity of their behavior to the new form of *P. infestans* makes it practically certain that Müller's wild plant is some one of the many forms of *demissum*, a species unknown outside of Central Mexico.

Several Mexican species are being used extensively in a breeding program for the development of blight resistant or immune domestic varieties in U. S. A. as well as in other countries and it becomes a matter of concern to determine as soon as possible whether biotypes exist in North America. Some tests have been made at Ithaca. They indicate rather clearly that only one form has been involved or else

that the varieties of potatoes employed were such that differences could not be detected. Records cover the years 1927 to 1932 inclusive but no systematic and comprehensive series of tests with all of the different samples of the fungus and a uniform series of potato varieties has been made. At the outset *S. demissum* and its hybrids were not available for test and in the meantime some of the cultures of *Phytophthora* were discarded or lost. The fungus has been obtained from the following sources: New York State, 7 cultures from potato from as many different counties and 2 from tomato from 2 counties; 1 from Presque Isle, Maine, from potato; 2 from West Virginia, one from potato and 1 from tomato (?); 2 from California from tomato; 1 from Ontario, Canada, from potato and 1 from Prince Edward Island, Canada, from potato. The potato varieties employed year after year include Ekishirazu, Evergreen, Smooth and Russet Rural, Green Mountain, Triumph, Cobbler and a long series (never less than 50) of Ekishirazu hybrids representing a range from resistant to susceptible. The same culture of *Phytophthora* was not used from year to year and yet there never has been noticed any marked variation in reaction of these varieties and the minor ones observed could be accounted for on the basis of some known condition of the experiment. This comparison of yearly records involving as it does a large number of plants and cultures of *P. infestans* from 16 sources employed at one time or another rather discouraged further attempts along this line. In consequence the inoculations on *demissum* hybrids were not so closely checked but it can be said for certain that the fungus from at least 3 sources has been used on fairly large numbers of these hybrids in addition to the named varieties and hybrids mentioned above without any indication of biologic specialization.

The fungus from California tomato proved to be more virulent than either of the cultures from New York tomatoes in that it produced definite lesions on the foliage of more varieties of tomatoes than did the New York cultures. When the California culture was compared on susceptible potatoes a greater virulence was again noted, the criteria being period of incubation, size of lesions produced and time required for penetration of the germ tube. After a few generations of cultivation on raw potato slices under identical conditions these cultures were no longer separable on the basis of virulence.

A more extensive comparison was made with cultures from California tomato, 2 New York tomatoes and 2 New York potatoes. Tomato plants of the varieties Bonny Best, Ponderosa and Yellow Globe, potatoes of the varieties Evergreen and Russet Rural and several potato hybrids of varying resistance were inoculated simultaneously and under identical conditions. On the basis of the criteria just mentioned these cultures were all alike with the exception of the culture from California tomato. The greater virulence of this culture was

uniform on all of the plants tested and does not suggest the existence of a biotype, especially since its virulence soon weakened and the culture was no longer distinguishable from the others. In this connection it is to be noted that a similar difference in virulence in other species of *Phytophthora* has been found repeatedly by Tucker (8) (1931, p. 105) in his extensive study of the genus.

As is well known, biotypes of *Colletotrichum lindemuthianum* never have been separated on the basis of morphology. Müller examined his cultures of *Phytophthora infestans* for morphological differences but failed to establish the existence of such differences. In view of the outcome of infection experiments there was little reason to expect that the assemblage of cultures from U. S. A. would show morphological differences. Nevertheless, sporangia from all of the cultures were measured. The cultures were incubated on raw potato slices at temperatures of 3, 6, 9, 12, 15, 18, 21 and 25° C. and 250 sporangia from each culture were measured. No difference in size or shape of sporangia could be established for the various cultures. In fact a temperature difference of 3° allowed for more variation in a given culture than ever was found in the various cultures.

No physiological differences were found in the cultures either. The criteria examined particularly were rate of growth of mycelium, and ability to produce sporangia on various media.

These experiments and observations indicate that one form of *P. infestans* is widely distributed in U. S. A. and suggest that it is similar to the form which is prevalent at Munich in Germany and as far east as Moscow in U. S. S. R. The wide-spread occurrence of one form in U. S. A. is easily accounted for in that seedstock and especially seedstock certified for its low disease content is very widely distributed. Although such stock is presumably free from *Phytophthora* rot it is well known that tiny lesions can not be distinguished by the minutest scrutiny much less by the inspector who must pass on the condition of health of thousands of bushels without examining each tuber individually. Furthermore, table stock is much more widely distributed than the bulk of the commodity would suggest or perhaps warrant and it is well known that the indiscriminate small planter may use such stock for seed purposes.

The various cultures of the fungus have been allowed to die. Even the one which was kept for stock purposes was killed during the hot summer of 1931 and a new culture had to be acquired from Maine. It would seem from what has been said in the preceding paragraph that there is no object in reassembling such a collection. If more than one form of the fungus exists in North America and if certain of the new hybrids of several wild species from Mexico have the proper constitution to demonstrate the occurrence of biotypes it seems likely that the existence of such types can be established by isolating the fungus re-

peatedly from a relatively restricted locality, as, for example, in a southern community where seedstock is obtained from a number of sources. Perhaps an equally effective method would be to grow a large number of the hybrids in a locality in which blight may be expected each year as for example in Aroostook County, Maine.

SUMMARY

Phytophthora infestans as it occurs in most parts of North America either is not biologically specialized or else the varieties of potatoes and tomatoes now grown are not kinds that reveal the presence of more than one form. The form prevalent in North America is the same as the one which occurred at Moscow in 1928 and at Munich in 1930. The demonstration of a biotype in Pomerania in 1932 may be attributed to a new form arising from the production of viable oospores of the fungus or to the fact that a hybrid possessing *demissum* "blood" serves to bring out the existence of such a type.

ITHACA, N. Y.

GENEVA, N. Y.

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FOSTERING THE CERTIFIED SEED POTATO DEAL MORE EFFECTIVELY

E. M. GILLIG

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In every possible sense of the expression in this title, there is need for more effectiveness, more thoroughness, and more coordination in handling the certified potato deal. This applies not only in the pro-

duction or certification end of it, but also in the commercial channels. A great deal of very effective work has been done along these lines in the last few years, but nevertheless the advances made in this industry and the enormous growth in volume, together with the commercial competition which it naturally meets, has caused this industry to outgrow even the best "clothes" which we have provided for it in the past.

All of us, in our own states, have been doing a great deal of good, conscientious work to make the best of it; we have helped our growers locate what we thought was very good foundation seed stock; we have advised with them as to properly producing this seed; then when we found it acceptable in our way of judging the situation, we certified it and then allowed it to be sold as seed under our certification system. At times a few of us have gotten together and formulated standards by which to judge the seed that was to be certified, and have tried our best in most cases to work out our local situation according to these standards, and according to what we felt we knew otherwise about the deal.

Next let us consider how our work and methods in the past and present are qualified to meet the present and future situation. It is common experience with all of us that any situation is rather easily handled when its proportions are small, or when it is more or less localized. Our certified potato deal of today and tomorrow is the very opposite of this, in every respect. It is an industry which covers the entire continent of North America, including some of our island neighbors, such as Cuba. At the same time it has grown to enormous proportions from what it was even less than ten years ago.

Another situation which has not been very well comprehended by probably most of us is the fact that what is going on in Maine or New Jersey with regard to the certification of potatoes has a most important and most direct bearing and financial consequence on what is going on in North Dakota or Nebraska in the certification and marketing of potatoes. Just four days ago one of our local certified seed potato shippers called our office and explained that a prominent receiver in Florida had just wired him to the effect that his quotations were much too high on his certified Bliss Triumphs, because certified seed Triumphs could be bought much cheaper from Maine or Wisconsin.

A few of us who have been fortunate enough to cover large areas of the United States, in both the producing and consuming areas of the potato seed industry, have found that while it seems that all have been trying to work rather uniformly in the certification of potatoes, still over half of us differ very materially from each other in the way we interpret or use the uniformly recommended standards and methods, and consequently differ also very widely in the results that we obtain from them as shown in the various qualities of the seed which

is shipped down south each year. Behind this latter statement are facts and observations within my own direct and personal experience over a period of quite a few years.

As stated before, we can conscientiously say that each one of us has in his own state tried his level best way to produce high quality certified seed for the market. Most of us have, however, stopped right at that point, never thinking that this careful structure which we have prepared and developed, needs any protection or insurance of any kind. We have ignored the fact that all of our good work in producing and preparing certified seed for the market, can be undone and destroyed overnight after it leaves our hands.

We know that the seed has been allowed to leave some states without having the bags or the container sealed in any manner, which in the condition of modern commerce is an open invitation to fraud and substitution. In many cases also the state certification agency has had no protection, United States copyright, or no local state protection over the trade mark, or insignia which they have been using to identify and guarantee certification. One of the most lamentable conditions here is the fact that there is at present no Federal legislation or regulations to protect the certified seed potato industry in America. We know this as a matter of fact because in the last two years we have tried every Federal agency conceivable, in an attempt to have them curb certain fraudulent practices which were far reaching. We even resorted to the Secretary of Agriculture to use his power to make regulations under the Federal Seed Act, and asked him to construe that certified seed potatoes could be considered as "seed" under this act. The only reply by the solicitor general of the department, was that this was legally impossible. The Federal Trade Commission as well as the Federal Food and Drug administration seem to find themselves in the same predicament in that they are unable to do anything definitely or effectively for the certified seed potato industry.

When the certified seed potato deal was a small affair in this country, it was not subject to the commercial hazards in distribution which it now is the victim of. The present day values that are recognized for certified seed, and the wide usage which it is now getting, makes it a target of more commercial and agricultural irregularities and fraud than can be described in a paper of this nature. The important factor for us to consider in this connection, however, is that all of these unfavorable recent developments threaten the life and the value of the certified seed potato deal and practically undo the work and value which we have put into it. With the legitimate certified seed potato industry meeting the drastic competition and the grave hazards which now actually threaten it, it simply means that immediate steps must be taken to effect some drastic changes.

Since the legitimate certified seed potato business is a national as well as an international affair, there must be some appropriate and effective Federal protection offered to it, in a similar way that the seed industry with reference to other agricultural crops now has. Certified seed potatoes now stand unprotected in interstate commerce, as has been so clearly demonstrated in several very recent instances.

Each state of course will and should have the management and jurisdiction over its own certification work. It is important however that both the standards and the methods which are used in the various northern producing states should be quite substantially similar to each other. We should not work on the theory that each state is all sufficient unto itself and need not be concerned about the exact way that its neighbors are doing the same things it is doing. Both the methods and the standards of our certification work should therefore be more closely coordinated in order to bring more uniform results and qualities in the product.

Another factor which must be considered is the seed consuming states. These states have their own ideas as to just what should constitute good certified seed, and are beginning to establish regulations and quarantines with many and divers specifications in them. Maybe these states are right, and maybe they are wrong, but in any event we have a chaotic condition in this respect at present.

There should be close harmony and coordination, not only in the rules and methods of the certification processes in each state, but also something more definite and uniform in application to our certified seed potatoes in the channels of distribution. The common table stock potato deal all over America has an absolutely uniform and standardized system of market grades, and market grade inspection service under the official use of such Federal grades. In our certified seed potato industry only very few of the states have attempted anything very definite in this connection and in such instances the states do not agree with each other. The statement is made that it is impossible and impractical to try and establish any sort of uniform standardized market grade or quality for certified seed potatoes. Judging from the writer's own personal experiences, such conclusions are not well founded. Irregularities and lack of uniformity or coordination in any project or in the handling of any commodity always brings on confusion and misunderstandings, and such a condition always lends itself to malicious commercial irregularities, fraud and other illegal as well as unethical practices.

Probably not only the market grade inspection service but also the local state certification service on potatoes might well be handled in the standardized and co-ordinated way that the market grade inspection service on fresh fruits and vegetables is handled by the Federal Bureau of Agricultural Economics. Our product, the certified seed

potato, has the serious handicap of being judged and appraised in commercial distribution, to too great an extent by its superficial appearances rather than by its actual seed values which are otherwise determined by the inspection work back in the state where it is produced. Such other seed values are, however, also receiving more and more serious consideration on the part of the consumer, and it behooves us therefore to work in all avenues of improvement, as this paper has attempted briefly to refer to, and bring a greater co-ordination of both the methods and the results, thus fostering the certified seed potato deal more effectively.

EARLY POTATO MARKETING ALONG THE ATLANTIC SEABOARD

A. E. MERCKER*

The Interstate Early Potato Committee is a planning committee sponsored by the Extension Service and Bureau of Agricultural Economics of the U. S. Department of Agriculture and the Extension Service of the States of Maryland, Virginia, North Carolina, South Carolina, Florida and the North Carolina State Department of Agriculture. It has been in operation for the past four years. Its personnel consists of the state directors of extension and one of their marketing specialists, a grower and a shipper from each state, and members of the Federal Department of Agriculture. It is entirely financed by public funds. All branches of the industry are invited to cooperate.

This Committee meets early in the fall of each year, and studies the results of the Department of Agriculture's research work on the outlook and prospects for the next season's early potato crop. It makes definite recommendations as to the acreage to be planted in each of the southeastern states. In order to bring about acreage adjustment, we hold about fifty meetings, attended by three thousand potato growers, or 40% of the southeastern producers; also twenty meetings with marketing agencies, bankers, fertilizer manufacturers, and other organizations financing producers.

The potato marketing program consists in establishing an informal clearing house for mutual information. It starts operation at Hastings, Florida, early in April. Then it moves on to Washington, North Carolina, in June, and over to the Eastern Shore of Virginia and Maryland during the latter part of this month.

* A radio talk by A. E. Mercker, Extension Service, delivered in the Land Grant College program on Wednesday, June 21, 1933, and broadcast by a network of 50 associate NBC radio stations.

This clearing house assembles, as far in advance as possible, the most reliable information on the production of early potatoes in the various competitive shipping sections. From these data we estimate the probable number of carloads that each section may ship during each week of the shipping period and the weekly movement of late potatoes. We change these tabulations twice weekly to make them more accurate. They have helped to bring about a more even flow of shipments from the southeastern states. Growers among competing sections have made sincere efforts to avoid glutting the markets with unnecessarily heavy shipments, especially when one section's shipments are declining and another starting. Summaries containing daily marketing information as to the total number of carloads sold, prices, distribution, cars consigned, those rolling unsold, track and yard holdings, and the estimated number to be loaded the following day are sent to each marketing agency every evening so that they know the strength or weakness of their market. Prices for the following day are then adjusted in accordance with these facts. Each marketing agency quotes the same f.o.b. price for the same grade and package of potatoes to all of their terminal market connections. The marketing agencies have requested that the Committee help in the stabilization of prices and the elimination of price cutting wars. They have felt that price cutting is very detrimental to the grower and in the past has caused buyers to hesitate to buy f.o.b. Through the Committee's efforts a firm price base is established, which is often at a higher level than the buyers anticipated. The elimination of price cutting is generally believed by the marketing agencies to greatly help the growers and themselves. It increases confidence, stabilizes prices, and, in some instances, benefits certain localities financially.

From Florida to Norfolk, Virginia, 95% of the marketing agencies cooperate as closely as it is possible for them to work together. They do not work together so well on the Eastern Shore of Virginia and Maryland.

The following letter, written by a shipper of southern potatoes, summarizes the results of the work briefly:

"For North Carolina there are a great many deals that should be discussed and worked out before another season rolls around. We certainly feel that the Department's work in marketing this potato crop from Florida to Norfolk was very effective this year and was the means of the farmers in North Carolina securing a million dollars or more for their crop of potatoes than they would have got working independently. We can readily see the great advantage of this movement when we compare the marketing of the North Carolina crop with the marketing of the Virginia crop that followed so closely."

POTATO SPRAYING IN OHIO

PAUL E. TILFORD

Ohio Agricultural Experiment Station

The diseases and insects which attack potatoes and are controlled by spraying vary in the different potato producing sections of the country. Late blight, for instance, which has sometimes been called "the potato disease" because of its severity in certain northern sections, seldom occurs in epidemic form in Ohio. An average Ohio season is so dry and hot that it is impossible to find a laboratory specimen of late blight even in unsprayed fields. Early blight is more prevalent, but ordinarily does not appear until late in the season when it may cause late potato vines to die prematurely and decrease the yield by shortening the fall growing period. The fact that we are out of the late blight belt does not simplify our spraying practices, since we are in the very "heart" of the high temperature, tip burn, leaf hopper, and flea beetle section of the country where potatoes are grown commercially. These handicaps, undoubtedly, demand a more thorough spraying program than is necessary to control late blight.

Unsprayed potatoes in Ohio, especially late varieties, die from 2 to 6 weeks earlier than when properly sprayed, due to the factors mentioned above. Ohio summer temperatures are generally conceded to be far above the optimum for tuber production and unless the late crop can be kept green and growing until cooler weather arrives in the fall, the yield is always small. In spraying experiments conducted during the past 9 years with late potatoes, the average yield of unsprayed plots has been 178.1 bushels per acre; whereas the yield of sprayed plots during the same period has been 273.0 bushels per acre. Spraying during this period gave an average increase of 94.9 bushels per acre.

Experiments and experiences of growers have shown beyond doubt that 4-6-50 Bordeaux mixture prepared by using hydrated lime is the correct spray mixture in Ohio. The average yield of plots at the Experiment Station for a 4-year period sprayed with 4-6-50 hydrated lime bordeaux was 283.9 bushels per acre; whereas plots sprayed with 4-4-50 stone lime bordeaux yielded 274.9 bushels. The average yields from test plots, conducted by some of the best growers in the state comparing the effect of bordeaux prepared with hydrated lime and with stone lime, was 305.9 bushels, and 302.2 bushels per acre, respectively. During the hot weather in July and August, most Ohio growers add extra lime to the bordeaux so that it forms a whiter and thicker covering on the leaves, which acts as a shade and helps the plants to withstand the heat. If arsenate is not used in the spray, an additional 3 pounds of lime to 50 gallons may be used. When 2

pounds of calcium arsenate is used to 50 gallons of spray, however, there is no need of using more than 1 pound of extra lime.

Two types of hydrated lime are available in Ohio for spraying purposes; high calcium lime, most of which is shipped in, and high magnesium lime, which is produced in the state. Grades of both types are offered on the market which are sufficiently fine to be entirely satisfactory for spraying. It was thought at one time that a high calcium lime was necessary for potato spraying. Experiments have proven this idea to be wrong, however, and we have found the Ohio high magnesium spray lime to be entirely satisfactory.

Recent work at this Station has shown that the use of 2 pounds of calcium arsenate to 50 gallons is advisable in all sprays throughout the season for flea beetle control. Flea beetles are serious pests in Ohio. They start working on potatoes as soon as they are up and increase in numbers throughout the season.

Spray applied under a medium pressure covers better than when applied under extremely high pressure. In experiments conducted for 2 seasons, the average yield of plots sprayed at 200, 400, and 600 pounds' pressure was 248.5, 259.5, and 245.7 bushels per acre. A pressure between 350 and 400 pounds is considered most desirable. Practically all commercial growers in Ohio use a pressure about 300, and most of those who have the larger machine spray at about 400 pounds' pressure.

Instant bordeaux, prepared from "snow" copper sulfate, is not generally used in this state as yet, although experiments have shown that it is satisfactory.

The number of applications of spray which are profitable varies from one season to another, depending on the date of planting, weather conditions, fertility of the soil, etc. It is safe to say that the minimum number of sprays for the late crop, planted in May, is 8 or 9 although in some seasons as many as 12 applications are necessary and profitable. The early crop seldom receives more than 4 or 5 sprays. Because of flea beetles it is necessary to put on the first application as soon as the plants are up 3 or 4 inches. Usually, 1 or 2 more sprays, at 10-day to 2-week intervals, are sufficient until hot weather arrives in July. During the hot weather in July and August it is necessary to spray every week. Upon the advent of cooler weather the interval can be lengthened out again. The total number of sprays depends, to a large extent, on the weather.

In conclusion, it can be said that spraying is absolutely essential for profitable potato production in Ohio. Thorough and frequent spraying is necessary, and the cheapest potatoes we can grow are the extra bushels per acre produced by spraying.

SECTIONAL NOTES

MAINE

The final acreage in Maine, in the opinion of conservative observers is between 135,000 and 140,000 acres, a reduction of from 15 to 20 per cent; from 168,000 acres planted in 1932. Considering it in the abstract, this does not mean so much to the casual observer. When one figures that 15 to 20 acres have been eliminated from every 100 acres planted last year a better conception is had of the extent of the cut.

All experienced observers in the Maine deal realize that serious developments have taken place to cause a reduction of that proportion. It might be of interest to briefly enumerate some of the contributing causes.

First, and of most importance, is the extremely low price level at which the last two crops were marketed.

Second, compulsory restrictions of acreage by governmental loaning agencies which have been practically the only type of credit available this year to Maine farmers.

Third, the tendency to increase local production of food supplies nearer the centers of population which compels a reduction in producing territories far from markets. This situation is appreciably aggravated by the exorbitant freight rates covering shipments of Maine potatoes.

There is, however, a more hopeful attitude on the part of farmers generally than has been evident for over three years. Maine has enjoyed a healthy price increase for old table stock potatoes. With the upswing in commodity price levels and wage levels coupled with the fact that early states are cleaning up promptly, it would appear that Maine should have materially brighter prospects for this year's crop.

Conditions generally have been very favorable thus far this growing season. The season was late in starting but the crop was planted quickly, very few potatoes being planted late enough to curtail yields. Weather and soil conditions have also been favorable for the growth of the crop. It is too early to give any idea as to how much this actually will influence production, of course, since the plants are just breaking through the ground.

A fact that must not be overlooked in considering the Maine situation this year is that there has not been any extensive financing by private commercial organizations. Credit has been advanced by governmental loaning agencies which assures the farmers of support in a constructive marketing program. In other years following a period of low prices, a large proportion of the crop has been controlled in one way or another by commercial groups to the detriment of the producer, who was usually compelled to liquidate early in the shipping season.

This placed a large proportion of the crop in the hands of a comparatively few persons who were enabled to take advantage of any rise in the market, and the producer lost accordingly.

Another factor of importance to the Maine grower this year is that he will be able to grow the crop more cheaply than for many years. Labor costs and prices for supplies that he must purchase are lower than ever and with very little money to operate on, nothing will be purchased except that which is absolutely necessary.

These factors taken together make the outlook quite favorable for the Maine grower this season.—FRANK HUSSEY.

NEW JERSEY

The potato marketing plan, drawn up by a committee of growers and dealers has been adopted. It is expected that by the time the marketing season opens approximately 85 per cent of the acreage in Monmouth, Mercer and Middlesex Counties will be signed up to be sold by the dealers who agree to market the crop under the plan. At the present time the following eleven dealers have agreed to operate under this plan: Bennett & Clayton Company, Inc., Bennett & Forman, Burlington County Produce and Supply Company, Chamberlin & Barclay, Inc., Ed. Dilatush & Company, Inc., R. W. Dilatush, John M. Laird, Reed & Perrine, Rooney & Ely, Inc., Scheidler Brothers, Inc., and Swinger & Perrine.

It is impossible to present all of the details of the plan here but the purpose is to market the crop in an orderly manner and eliminate price cutting which has been so prevalent in past years. The organization of the dealers is to be known as the Potato Sales Company with the central office at Hightstown. Some of the more important details of the plan follow.

A joint committee consisting of six dealers and seven growers is to be appointed. It will be this committee's duty to make any necessary changes in prices, discontinue digging and loading when this is considered to be necessary and have general supervision of the central office. All sales are to be made through the central office and will be pro-rated among the dealers represented in the office. The price to be paid the growers each day is to be the pool price of all sales. The pool price will be determined when two-thirds or more of the potatoes, reported each day to the central office, are sold. In the case of truckers all sales are to be made through the central office. The trucker will secure an order from the dealer and this in turn will be presented to the grower. The dealers will be responsible for all collections from truckers.

The New Jersey potato growers and dealers feel that this is a progressive step and they are convinced that the adoption of the plan will result in better prices to all. This new deal in potato marketing will

be watched with considerable interest by the potato industry.—Wm. H. MARTIN.

PENNSYLVANIA

The acreage is about the same as last year, with possibly a further increase in Cobblers. This is in line with the tendency of the past few years. Planting the main crop was delayed by wet weather and some rotting of the seed pieces is reported from Somerset County. In most sections of the state June has been dry so far with some very hot periods. There was a heavy frost in the mountain and western counties in June which set back the early crop somewhat but did little damage to the main crop. Some fields of Cobblers are now in bloom but show insufficient vine growth for best prospects.—J. B. R. DICKEY.

VIRGINIA

The weather has been very dry for the past three weeks and fields planted with northern grown seed are beginning to die very rapidly; the acreage planted to home-grown seed will give a very low yield unless we get rain within a few days. Lice, leaf hoppers, and flea beetles are appearing in great numbers through the upper part of Accomac County. The present yield from northern-grown seed varies from twenty-five to seventy-five barrels per acre, mostly thirty-five to forty-five barrels.

Very little flea beetle control work has been done in upper Accomac County, where this insect is so abundant; therefore, it is expected that the tubers will be severely injured by the flea beetle larvae, which will doubtless throw many cars out of grade. Some trouble was experienced along this line last year.

Our potato harvest is moving along very rapidly and the price is holding around \$3.75 to \$4.00 today and yesterday. One or two lots brought \$4.05 per barrel on June 22, many \$4.00.

The Eleventh Annual Potato Tour and Field Day was held at Onley on June 15, with representatives present from eleven different states and the largest number of local growers ever to attend one of these meetings. Considerable interest was shown in the experiments being conducted to determine the best location of the fertilizer. Where it was applied in bands two inches to each side of the seed piece the vines were larger and more uniform than where the fertilizer was applied in the row. Experiments on the control of the flea beetle, virus disease studies, and the seed source demonstration likewise attracted attention.—W. O. STRONG.

SOUTHERN STATES

The yields in South Carolina averaged around 60 barrels per acre, potatoes were of good size, but generally showed some decay. Ship-

ments during the month of May were about 17,900 cars, which was 500 less than were shipped during the same month in 1932. There were shipped about 9,600 cars of old potatoes compared to 12,800 shipped during the corresponding month last year. However, 8,330 cars of new potatoes were shipped this May compared with 5,560 shipped the same month a year ago. The southern season is a week earlier than last year. The prevailing f.o.b. prices were about \$2.50 per barrel for South Carolina potatoes, and the weighted average is around that figure. Distribution was fairly good, a few cars being shipped as far west as Chicago the latter part of the month.

North Carolina shipped about 1,300 cars of potatoes the week of May 29 to June 3, 2,700 the following week, and 2,000 from June 12 to 17. A price of \$2.75 was maintained from May 29 through June 6. Then a spell of exceptionally hot weather struck the country and shipments in North Carolina rose to between five and six hundred cars a day. For three successive days the price dropped 25 cents, reaching \$2.00 on June 9. This price attracted the broadest demand that the State has ever known, and when Saturday night rolled around there were practically no cars remaining unsold, and their distribution was from Portland, Maine, to Cedar Rapids, Iowa, and as far south as Tampa, Florida. The price then rose, reaching \$3.00 on June 20, \$3.10 on June 21, and from \$3.40 to \$3.50 on June 22. The price on the Eastern Shore of Virginia advanced from \$2.25 on June 12 to \$4.00 a barrel on June 22. This is the first time in three years that the markets were able to recover in a marked degree after they had once gone down. It certainly looks as if this is sufficient proof that confidence is returning and that the depression in the potato business is over.

Yields in the Norfolk section of Virginia are reported as ranging between 30 and 45 barrels to the acre this season compared with yields of 60 to 100 barrels last year when 2,700 carloads of potatoes were shipped. Probable shipments this year are estimated at between 1,500 to 2,000 cars. The yields were reduced because of an exceptionally dry May. On the Eastern Shore of Virginia yields are estimated at around 30 barrels per acre in Northampton County, which also suffered from very dry weather in May. Accomac County, which is largely planted to home-grown seed, is expected to average around 40 barrels per acre. A rain may help this county and improve its yields but it must come very soon. It is generally believed that a rain would not help the crop grown from northern grown seed as they generally matured about ten days earlier. Shippers' estimate of carload shipments range from 6,000 to 8,500 cars. Prospects in Maryland of the yields are slightly better than those expected in Accomac County, but the acreage has been reduced about 15 per cent and car-

load shipments will probably fall below those of last year when 1,600 cars were shipped. The Oklahoma potato crop is not expected to exceed 15 to 18 hundred cars, and the Arkansas crop 450 cars.

Since the June 1 crop condition report the potato sections of the country have suffered two terrifically hot spells with practically no moisture falling in the potato growing sections since the first of June. In the Kaw Valley and Orrick, Missouri, sections the potato crop is badly in need of moisture. The ground is generally packed hard and very dry. Shippers report carlot shipments from both these sections will fall far below those of last year. The crops in New Jersey, Long Island, Pennsylvania and Ohio were generally planted this year much later than is usual because of the very rainy weather prevailing during April. This will give the southern shippers a few more days in the marketing of their crop. With the South, the Southeast, and the Southwest cleaned up, they having shipped all of their potatoes to market, they are now buying potatoes. The Cuban import duty as applied to United States grown potatoes is removed. All this will afford the growers from Long Island to Illinois a much wider outlet for this season's crop. With inflation having hit potatoes, higher prices are in prospect for the crop than were anticipated earlier. A. E. MERCKER, U. S. D. A.

NEW YORK

The Annual Summer Field Day of the Empire State Potato Club will be held on Wednesday, August 9, on the Walter Miller farm near Williamstown, in eastern Oswego County. The principal speaker of the day will be Hon. John A. McSparran, Secretary of Agriculture for Pennsylvania. He is well known throughout the east as a most forceful speaker on farm problems. H. L. Page, popular farm bureau manager for Oswego County, is general chairman of arrangements.

The Empire State Potato Club in cooperation with the several farm bureaus in potato counties will again conduct the annual contest for the award of premier potato grower. Last year Oneida and Genesee Counties carried off most of the honors. This year the rules of the contest have been revised in a way that it is hoped will interest more growers. The cost of production feature has been eliminated as many felt this feature was too complicated. Although cost records are highly recommended and will be kept by many, this is not required as a part of the contest. Growers who enter the contest this year will be rated 75 per cent on yield of U. S. No. 1 grade and 25 per cent on field run yield from the entire potato acreage. No grower of less than 5 acres is eligible.—E. V. HARDENBURG.